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Diversity factor formula in power system

What is diversity factor in power system. Power diversity factor. Diversity factor formula.

In power stations, electricity can't be stored for later use, so it's essential to produce electricity according to consumer demands. This means the various electrical sources at a substation must meet load requirements at all times. However, the highest demand from different load centers doesn't occur simultaneously, making it possible to design smaller electrical sources that supply peak demands happening at different times. The diversity factor is crucial in understanding how these loads demand the highest loading throughout a particular time period. The diversity factor can be defined as the ratio of the sum of individual maximum demands and the maximum demand on the power station: Diversity Factor = (Sum of individual max demands) / (Max demand on the power station). Mathematically, it's expressed as FD = (D1+ D2+D3+...+Dn)/Dg. The diversity factor plays a key role in determining power generation costs and is essential for designing smaller electrical sources to meet peak demands efficiently. The importance of the diversity factor lies in its value always being greater than 1, indicating that the power generation cost will be lower. This is because individual demands don't happen simultaneously; they occur at various times throughout the day due to load diversity. By understanding this diversity, electrical engineers can design substations or utilities with a lower capacity to meet the connected loads' peak demands efficiently. The various types of megawatts, including 'Q', 'R', 'S', and 'T' megawatts, were measured for their corresponding values. The maximum load for the 'X' substation was found to be 'X' megawatt, thus enabling the calculation of its diversity factor. To determine this, the total sum of all loads (P+Q+R+S+T) is divided by the highest demand ('X'): Diversity Factor = (P+Q+R+S+T)/X For example, in a power transformer connected to 1300 kW industrial load, 90 kW domestic load, and 60 kW municipal load with a maximum demand of 1500 kW, the diversity factor is calculated as follows: Diversity factor = (1300+90+60)/1500 = 0.9 A table outlining the diversity factors for different systems is provided below. Advantages of using the diversity factor include lower power generation costs due to higher diversity factors and its role in determining the price of power generation. However, a poor diversity factor value of one indicates a need for correction, and lower values can result in higher power generation costs. The diversity factor has various applications, such as coordinating studies within engineering-based topics and estimating loads at specific nodes. It also helps predict how loads demand maximum loading throughout a particular time period in a day. Calculating total load current helps determine the plant equipment's capacity and aids in electrical system design & analysis. This process involves considering the diversity factor, which accounts for varying loads across different periods. The diversity factor and load factor are crucial in determining the cost of electrical energy supply. When both factors increase, the cost per unit generated decreases. Understanding these concepts helps in accurately sizing equipment and optimizing plant performance. The diversity factor itself is a measure of how well loads are distributed over time, calculated as the ratio of average load to highest demand within a specified period. Plant capacity factor and diversity factor play significant roles in evaluating energy production efficiency. They help determine the actual versus potential energy output, considering factors like load distribution and individual demands on power stations or substations. In practice, the diversity factor can range from 1 (indicating simultaneous peak loads) to values greater than 1, reflecting the variability of customer demands over time.